Yang-Mills generalization of the geometrical collective model
GEORGE ROSENSTEEL, NICK SPARKS, Tulane Univ — The geometrical or Bohr-Mottelson model is generalized and recast as a Yang-Mills theory. The gauge symmetry determines conservation of Kelvin circulation. The circulation commutes with the Hamiltonian when it is the sum of the kinetic energy and a potential that depends only on deformation. The conventional Bohr-Mottelson model is the special case of circulation zero, and wave functions are complex-valued. In the generalization, any quantized value of the circulation is allowed, and the wave functions are vector-valued. The Yang-Mills formulation introduces a new coupling between the geometrical and intrinsic degrees of freedom. The coupling appears in the covariant derivative term of the collective kinetic energy. This kind of coupling is sometimes called “magnetic” because of the analogy with electrodynamics.